



Jeffrey H. Blum
Executive Vice President,
External & Legislative Affairs
Jeffrey.Blum@dish.com
(202) 463-3703

March 4, 2021

BY ELECTRONIC FILING

Ms. Marlene Dortch
Secretary
Federal Communications Commission
45 L Street NE
Washington, DC 20554

Re: IBFS File No. SAT-MOD20200417-00037; Expanding Flexible Use of the 12.2-12.7 GHz Band, WT Docket No. 20-443; Petition of Starlink Services, LLC for Designation as an Eligible Telecommunications Carrier, WC Docket No. 09-197

Dear Ms. Dortch:

DISH Network Corporation (“DISH”) submits this reply to Space Exploration Holdings, LLC’s (“SpaceX”) attempted attack on the report by non-geostationary (“NGSO”) system expert engineer Marc Dupuis on SpaceX’s compliance with applicable power levels.¹ In its letter,² SpaceX tacitly admits that it will not limit its system to one satellite in each frequency for each covered area and that, without such a limit, it will likely violate the equivalent power flux density (“EPFD”) limits adopted by the International Telecommunication Union (“ITU”) and the Commission for the protection of Direct Broadcast Satellite (“DBS”) customers, including the millions of U.S. households served by DISH. SpaceX does not refute the premise, methodology, or conclusion of Mr. Dupuis’s analysis set forth in the 49-page report submitted by DISH. And, critically, SpaceX does not refute Mr. Dupuis’s analysis that an Nco of 2 or more would violate the EPFD limits and endanger DBS operations.

Mr. Dupuis’s conclusion that the power limits will be exceeded was based on a realistic premise—that SpaceX will likely deploy overlapping co-frequency satellite beams to satisfy customer demand—and on a methodology involving the application of ITU-prescribed software to SpaceX data files. A constructive response from SpaceX would have been to explain why Mr. Dupuis’s factual premise is incorrect. Instead, SpaceX insists it is entitled to use the assumption that it will not operate overlapping beams, without regard to whether it will. In its words, “the Commission now relies upon the EPFD analysis conducted by the ITU,” and it confines itself to requiring “that NGSO FSS operators receive a ‘favorable’ or ‘qualified favorable’ EPFD finding

¹ Letter from Jeff Blum, DISH, to Marlene Dortch, FCC, IBFS File No. SAT-MOD20200417-00037; WT Docket No. 20-443 (Feb. 15, 2021) (“DISH Feb. 15 Letter”) (attaching *EPFD Assessment of SpaceX into DISH Ku-band GSO Networks*) (“Dupuis Report”).

² Letter from David Goldman, SpaceX, to Marlene Dortch, FCC, IBFS File No. SAT-MOD20200417-00037; WT Docket No. 20-443 (Feb. 25, 2021) (“SpaceX Feb. 25 Letter”).

by the ITU prior to initiation of service.”³ The Commission serves only as a “backstop[] . . . if necessary.”⁴ Apparently, to hear SpaceX, a favorable ITU finding is tantamount to operating in compliance with the limits, which is in turn “considered” to have fulfilled the NGSO system’s obligation not to cause unacceptable interference into DBS services.⁵ In other words, the Commission has little or no role to play even when faced with a credible analysis that millions of DBS customers are at risk of service impacts.

But what about the elephant in the room? Will SpaceX’s assumption of one satellite per frequency per area ($N_{co}=1$) be borne out by its operations? SpaceX resorts to the most indirect of answers: it accuses DISH of “implicitly assum[ing] that SpaceX would operate in a manner that would violate the Commission’s rules and the terms of its license.”⁶ Does this mean a one-satellite limit? Obviously not, because SpaceX would not have needed this contrived response, and would have instead said it outright. Does SpaceX mean that overlapping satellites would violate the Commission’s rules? Again, no, because SpaceX would have said so. Evidently, SpaceX wants the flexibility to operate free of its own assumption. If it wants to serve a town, logging camp, docked ship, or large vacation resort with tens or even thousands of people with many of them downlinking video at the same time, will SpaceX limit the number of beams to one and deny them service? SpaceX does not say it will.

Yet the limit of one beam at a time that SpaceX purports to impose on itself on paper would, if observed in real life, limit how many customers it can serve, and at what speeds. As Mr. Dupuis explained in his study, one SpaceX satellite beam using SpaceX’s downlinks can optimistically deliver a total of 200 to 300 Mbps of user traffic per beam, assuming that each beam employs a maximum of 250 MHz as reported by SpaceX in its FCC filings.⁷ Under the conservative methodology employed by Mr. Dupuis, this means that “one beam would only be enough to provide reasonable service to perhaps 100 users actively requesting service at a busy hour, with 10 users fully using the resource (30 Mbps each) at any given point in time, even as demand from hundreds or thousands is likely at crowded venues.”⁸ SpaceX does not refute any of this. At a speed of 100 Mbps, which SpaceX states it already provides,⁹ the number of active users and simultaneously receiving users would be 33 and 3, respectively. And it gets even more

³ *Id.* at 2.

⁴ *Id.*

⁵ *Id.*

⁶ *Id.*

⁷ While this could increase to 500 MHz or more per beam with the use of 8-PSK modulation and coding, this cannot be verified since SpaceX’s link budget information and channelization plan, though requested by DISH under a non-disclosure agreement, has not been provided. In any event, the number of users would still be far too low to make one beam at a time a viable proposition.

⁸ Dupuis Report at 14.

⁹ Starlink.com (“During beta, users can expect to see data speeds vary from 50Mb/s to 150Mb/s . . . As we launch more satellites, install more ground stations and improve our networking software, data speed, latency and uptime will improve dramatically.”) (last visited March 4, 2021).

incredible: SpaceX has announced it plans to provide speeds of up to 10 Gbps to each user.¹⁰ But, even at 1 Gbps per user, one beam would not suffice for even one user.

Seen in the most lenient light, SpaceX might be saying: trust us, we may not observe our own assumption (Nco=1), but the end result will work out all right. Even where we use more than one satellite, we will do it in a way that avoids exceeding the power limits. But to trust SpaceX, one would have to find a flaw in the calculations of DISH's expert Mr. Dupuis. SpaceX has identified none.¹¹

The EPFD limits are not a formality, to be met by virtue of SpaceX's choice of Nco=1 without regard to reality. They are intended as a substantive measure to ensure a real-life goal—the protection of millions of DBS customers spread across the country. In the Commission's words, "[t]hroughout this proceeding, we have focused on the ability of NGSO FSS operations to coexist with existing operations in several spectrum bands without causing unacceptable interference to those services."¹² It was to that end that the Commission required "an NGSO FSS applicant to demonstrate prior to becoming operational that it meets the operational EPFD limits to protect GSO BSS operations."¹³ SpaceX rests its compliance with the limits on the idea it will not use overlapping co-frequency beams in any area. We now know that it uses that idea as a basis for its showing, not because it plans to observe it, but because the ITU will not challenge it. But if the assumption is not consistent with the reality of its NGSO FSS operations, the asserted compliance is not worth the paper it is written on.

And where has the ITU stated that this assumption is acceptable even if it does not correspond with reality? SpaceX does not cite any international radio regulation that would permit that divergence of form from substance. What SpaceX is saying is simple: there is no express prohibition on assuming one thing and doing another, and it appears that the ITU will accept SpaceX's showing without asking any questions. But, even if that came to pass, it is obvious that the ITU's favorable ruling should not be enough for the Commission.

Such a ruling may perhaps satisfy the mere letter of one of the conditions placed by the Commission on SpaceX's authorization.¹⁴ But it does not dispose of a separate question—

¹⁰ See Letter from David Goldman, SpaceX, to Marlene Dortch, FCC, IBFS File No. SAT-MOD-20200417-00037, RM-11855, Attachment at 2 (Jan. 22, 2021).

¹¹ SpaceX's boast that it avoids communications when one of its satellites is around the geostationary arc, see SpaceX Feb. 25 Letter at 2, is meaningless. If the implication is that DISH should be content with that measure, the Commission and the ITU have correctly decided otherwise. The EPFD limits apply fully, and must be observed, outside this exclusion zone, notwithstanding SpaceX's cavalier view that they are "overly restrictive" of NGSO operations. *Id.*

¹² Amendment of Parts 2 and 25 of the Commission's Rules to Permit Operation of NGSO FSS Systems Co-Frequency with GSO and Terrestrial Systems in the Ku-Band Frequency Range, *First Report and Order and Further Notice of Proposed Rule Making*, 16 FCC Rcd. 4096, 4161 ¶ 166 (2000).

¹³ *Id.* at 4170 ¶ 195.

¹⁴ See Space Exploration Holdings, LLC, Application for Approval for Orbital Deployment and Operating Authority for the SpaceX NGSO Satellite System, *Memorandum Opinion, Order and Authorization*, 33 FCC Rcd. 3391, 3402 ¶ 29 (2018) ("We . . . condition the grant on the requirement that SpaceX

compliance with the Commission's own rules. The EPFD limits have been adopted not only by the ITU but by the Commission itself.¹⁵ The Commission must assess compliance with its own power limits without being bound to a standard of reduced care based on how carefully the ITU evaluates SpaceX's showing.

SpaceX's other defense is essentially that everyone does it. In SpaceX's words, it simply "used the same parameter as many other operators," including Hughes and OneWeb.¹⁶ But that assertion would (sort of) support SpaceX's position only if SpaceX was saying that everyone else is lying and getting away with it, and therefore why shouldn't SpaceX? If one system operator assumed only one satellite per area and did not plan to observe that assumption, SpaceX may have had a partial argument—that the ITU and the Commission have been tolerating noncompliance with their rules and should be estopped from picking on one operator to enforce these rules.

But this is not true. Other operators will naturally assume that only one satellite will serve one area if that is what they plan to do. First of all, SpaceX cites a number of OneWeb system filings with Nco values of 1.¹⁷ SpaceX disregards the fact that OneWeb's L5 (U.K.) filing, currently being deployed, assumes that 40 satellites can transmit co-frequency in order to capture the impact of geographically dispersed beams (*i.e.*, Oneweb's system uses an Nco of 40).¹⁸ This disregard is all the more troubling because Mr. Dupuis specifically pointed that fact out in his report.¹⁹ SpaceX's cherry-picking of newer filings from the same company that use a single satellite on a co-frequency basis per area is irrelevant. If these systems are implemented, their Nco will only be cumulative to the Nco of 40 for the system that OneWeb is now deploying. Similarly, Hughes's NGSO LEO filing is complementary to Hughes's existing infrastructure—Hughes already operates a satellite system in these bands with near global coverage. Thus, the already-deployed additional capacity covering the same area obviates the need for a greater Nco than 1.

In addition, none of the filings SpaceX cited represents the systems of 12 GHz band processing round participants. Indeed, other 12 GHz NGSO FSS proponents have used higher Nco values. In the 2016/2017 processing round, for example, Kepler's 140-satellite and Theia's 112-satellite constellation each used an Nco value of four, while OneWeb, as explained above,

satisfactorily undergo the ITU review process of its EPFD demonstration prior to initiation of service."); 3407 ¶ 40(n) ("Prior to initiation of service, SpaceX must receive a favorable or "qualified favorable" finding in accordance with Resolution 85 (WRC-03) with respect to its compliance with applicable equivalent power flux-density limits in Article 22 of the ITU Radio Regulations.").

¹⁵ 47 CFR § 25.146(a).

¹⁶ SpaceX Feb. 25 Letter at 1.

¹⁷ "Nco" refers to the maximum number of beams in any one frequency channel used to serve customers at any one geographical location. EPFD levels increase as more satellites transmit to a single point simultaneously.

¹⁸ See Letter from Jeff Blum, DISH, to Marlene Dortch, FCC, IBFS File No. SAT-MOD-20200417-00037, at 3, Appendix B (Aug. 6, 2020).

¹⁹ See Dupuis Report at 2-3.

used a value of forty.²⁰

It is plausible that some, or all, of the other NGSO FSS proponents used as examples by SpaceX may operate a single co-frequency beam on each area, if these systems do not purport to provide service to tens of thousands of residential customers at high data rates. Indeed, the concept of operations for these new systems—some with medium-earth orbits (“MEO”) for GSO-like service—may require only an Nco of 1. For a MEO system, one satellite per frequency per area is a much more typical characteristic than it is for a low-earth orbit system of many thousands of satellites. But, as explained by Mr. Dupuis, for SpaceX, an Nco of 1 is not realistic or credible.²¹

The EPFD limits are a serious matter. Clever ways of not triggering them should not be an achievement of which SpaceX should be proud, and are not enough to satisfy the concerns of exceeding them. Besides, signing up to this form-over-substance convention would be in no one’s interest. If that were an acceptable state of affairs, DISH and its customers would suffer more, but SpaceX and its customers would suffer themselves. When SpaceX operates at an Nco of 2 or more, it will exceed the limits and cause DBS interference. DISH will complain, and SpaceX will have to curtail its operations and its ability to meet customer demand in the future. This is not an appropriate way forward all around, and the public interest deserves the DBS interference issue be resolved *before* the Commission takes action on SpaceX’s Third Modification.

SpaceX shelters behind ad hominem attacks about DISH’s motives, DISH’s supposed delays, and DISH’s expert’s prior employment, while tacitly admitting the entirety of Mr. Dupuis’s premise and analysis. Instead, SpaceX should engage in serious conversations with DISH to fulfill its obligation to avoid unacceptable interference with DISH’s service. Until it does, the Commission should not grant SpaceX’s Third Modification.

/s/ Jeffrey H. Blum
Jeffrey H. Blum

²⁰ Letter from Jeff Blum, DISH to Marlene Dortch, FCC, IBFS File No. SAT-MOD-20200417-00037, at 3 (Aug. 6, 2020) (explaining the special circumstances for why Karousel and Kepler used an Nco value of 1).

²¹ See Dupuis Report at 17, 21-22, 49. Finally, a paper ITU filing does not mean the system that will be finally implemented will have the same characteristics. Operators have the opportunity to induce their administrations to modify the filings in order to bring them closer to real-life parameters at any time within the seven-year bringing-into-use period. In this case, however, some of SpaceX’s system is already in use, and SpaceX does not evince any interest in a modified ITU filing with a greater Nco.